

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

Listing of Claims:

Claim 1 (Currently Amended): An audio processor which processes an input data stream via an external memory, comprising:

a control processor to fetch in, when executing one of divided procedures of an audio process, a program and audio data corresponding to a next one of the procedures from the external memory device which stores programs and a group of data used for sequentially executing the divided procedures of the audio process;

an internal memory to store the program and audio data fetched from the external memory by the control processor and corresponding to the one and the next one of the procedures;

a coprocessor to subserve the control processor to subject audio data of the input data stream to the divided procedures of the audio process based on the program fetched by the control processor.

Claim 2 (Currently Amended): An audio processor according to claim 1, wherein the coprocessor is configured to subserve the control processor to subject sequentially the audio data to decoding, noise-less decoding, noise reduction, filter bank, and block switching in accordance with the programs and data fetched from the external memory device in units of one procedure.

Claim 3 (Currently Amended): An audio processor according to claim 2, wherein the coprocessor is configured to subserve the control processor to execute the program fetched in the internal memory from the external memory device in accordance with progress of the procedures of the audio process.

Claims 4-5 (Cancelled).

Claim 6 (Currently Amended): An audio processor according to claim 1, wherein the internal memory comprises an instruction memory configured to store an instruction group of the program transferred from the external memory device and a data memory configured to store a data group transferred from the external memory device, and the coprocessor subserves the control processor to perform the process based on the instruction group using the data in the data memory and data corresponding to a progress stage of audio data reconstruction to generate audio data.

Claim 7 (Currently Amended): An audio processor according to claim 6, which includes a DMA controller configured to control writing of data to the external memory device, the instruction memory and the data memory, and reading of the data therefrom by a direct access memory transfer.

Claim 8 (Currently Amended): An audio processor according to claim 1, wherein the control processor sequentially transfers a plurality of program modules corresponding to the plurality of procedures of the audio process to the coprocessor from the external memory device according to the progress of the procedures.

Claim 9 (Previously Presented): An audio processor according to claim 1, wherein the coprocessor subserves the control processor to execute decoding of bit stream data, noiseless decoding, inverse quantization, scale factor, TNS processing, filter bank processing, and the block switching, in this order, to reconstruct audio data.

Claim 10 (Previously Presented): An audio processor according to claim 9, wherein the control processor includes a function of predicting which procedure is performed after the procedure which is currently performed.

Claim 11 (Previously Presented): An audio processor according to claim 7, wherein the internal memory stores a program module which request the DMA controller for preparing, while continuing the procedure which is currently performed, the data group and instruction group that are required for the next procedure.

Claim 12 (Previously Presented): An audio processor according to claim 11, wherein a DMA transfer instruction is added to the program module in order to read the program module used in the next procedure from the external memory, the DMA transfer instruction allowing to read the program module with the DMA transfer by specifying the storage area.

Claim 13 (Currently Amended): An audio processor according to claim 1, wherein the control processor is further configured to save which allows data stored in the internal memory which is determined to be unused for a long time to be saved from the internal memory to the external memory if determined to be unused for a long time by the control processor.

Claim 14 (Currently Amended): An audio processor according to claim 13, wherein the control processor is further configured to release a storage region of the internal memory which releases the storage region of occupied by the data stored in the internal memory or the a program which if the data stored in the internal memory or the program becomes unnecessary.

Claim 15 (Currently Amended): A data processing apparatus for processing an input data stream via an external memory device comprising:

a control processor to fetch in a program and data to be used for a next procedure of an audio process from programs for encoding and decoding, input/output data, work data, table data which are stored in the external memory;

a coprocessor to subserve the control processor to perform data processing for coding or decoding according to the program fetched by the control processor;

a data memory to store the data fetched by the control processor;
an instruction memory to store the programs to be applied to the control processor;
and

a DMA controller to transfer the data among the instruction memory and the data memory and the external memory,

the control processor controlling the DMA controller to perform the encoding and the decoding using the coprocessor, read program and data required for the next procedure from the external memory, and write data obtained by the procedure into the external memory.

Claim 16 (Previously Presented): An audio processor according to claim 15, wherein the coprocessor temporally stops when accessing of the DMA controller to the instruction memory or the data memory competes with accessing of the coprocessor to the instruction memory or the data memory.

Claim 17 (Previously Presented): An audio data processing method for processing an input data stream using a program stored in an external memory, comprising:

storing programs and audio data used for sequentially executing divided procedures of an audio process,

fetching in, when executing one of the procedures, a program and data corresponding to next one of the procedures from the external memory using a control processor;

storing the program and audio data read from the external memory and corresponding to the one and next one of the procedures in an internal memory; and

subjecting the input data stream to the audio process via a coprocessor based on the program and data read from the internal memory.

Claim 18 (Previously Presented): A method according to claim 17, wherein the input data stream includes audio data, and the subjecting sequentially subjects the audio data to decoding, noise-less decoding, noise reduction, filter bank, and block switching in

accordance with the programs and audio data read from the external memory in units of one procedure.

Claim 19 (Currently Amended): An audio data processing method for sequentially subjecting input data to a plurality of procedures of an audio process, comprising:

storing a plurality of program modules corresponding to the plurality of procedures and data to be processed in an external memory;

reading, when executing one process, a program module and to-be-processed data which are used for a next procedure of the audio process from the external memory by a control processor; and

processing audio data of the readout data via a coprocessor in accordance with the readout program module.

Claim 20 (Previously Presented): An audio processor according to claim 1, wherein said coprocessor is configured to process only audio data.

Claim 21 (New): The data processing apparatus according to claim 15, wherein said coprocessor is configured to process only audio data.

Claim 22 (New): The audio data processing method according to claim 17, wherein said coprocessor is configured to process only audio data.

Claim 23 (New): The audio data processing method according to claim 19, wherein said coprocessor is configured to process only audio data.

Claim 24 (New): The audio processor according to claim 1, wherein the internal memory includes an instruction memory and a data memory, and at least two parallel busses lead from the instruction memory and the data memory to the coprocessor.

Claim 25 (New): The data processing apparatus according to claim 15, wherein at least two parallel busses lead from the instruction memory and the data memory to the coprocessor.

Claim 26 (New): The audio data processing method according to claim 17, wherein said fetching further comprises:

transferring the programs and the audio data by at least two parallel busses from the internal memory to the coprocessor.

Claim 27 (New): The audio data processing method according to claim 26, wherein said storing the program and the audio data in the internal memory, the audio data is stored to a data memory, and the programs are stored to an instruction memory.

Claim 28 (New): The audio data processing method according to claim 19, wherein said reading further comprises:

storing the program module and the to-be-processed data from the external memory to an internal memory; and

transferring the program module and the to-be-processed data by at least two parallel busses from the internal memory to the coprocessor.

Claim 29 (New): The audio data processing method according to claim 28, wherein the internal memory includes an instruction memory and a data memory, and wherein said storing, the to-be-processed data is stored to the data memory, and the program module is stored to the instruction memory.

Claim 30 (New): The audio processor according to claim 1, further comprising:
an audio input/output interface; and
an internal bus;
wherein the internal bus links the control processor, the coprocessor and the audio input/output interface together.

Claim 31 (New): The data processing apparatus according to claim 15, further comprising:
an audio input/output interface; and
an internal bus;
wherein the internal bus links the control processor, the coprocessor and the audio input/output interface together.